Human Factor Requirements

- Field of View (FOV)
- Fogging
- Communications

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Field of View (FOV)

- Requirement:
  - Visual Field Score (VFS) ≥ **70**
  - 1 Respirator that anatomically best fits the Head Form of the Apertometer of EN 136: 1998 or equivalent; VFS = Average Score of 3 Fittings
  - Derived From: AMA *Guides;* Functional Impact of VFS=70 Translates to Mild Visual Impairment (Requires Scanning For Obstacles)

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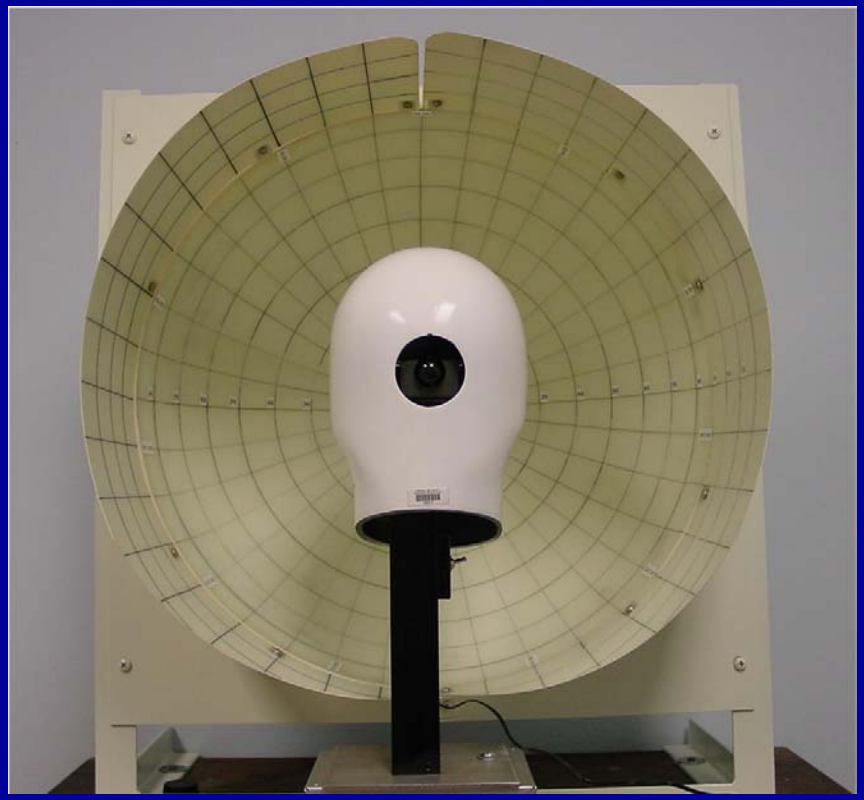
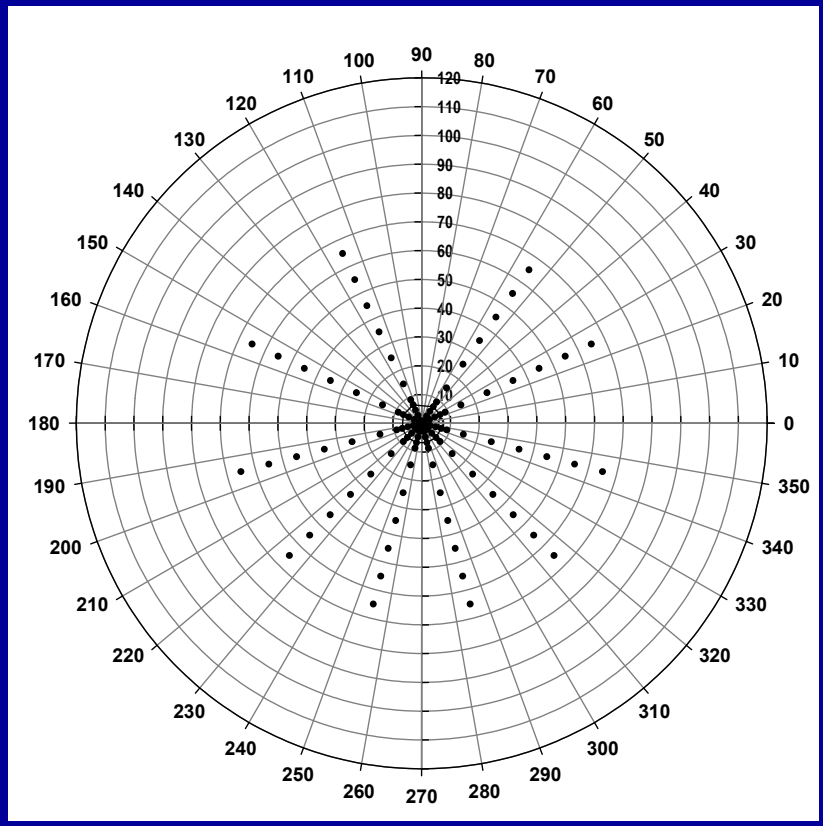
FOV Test Equipment and Methodology





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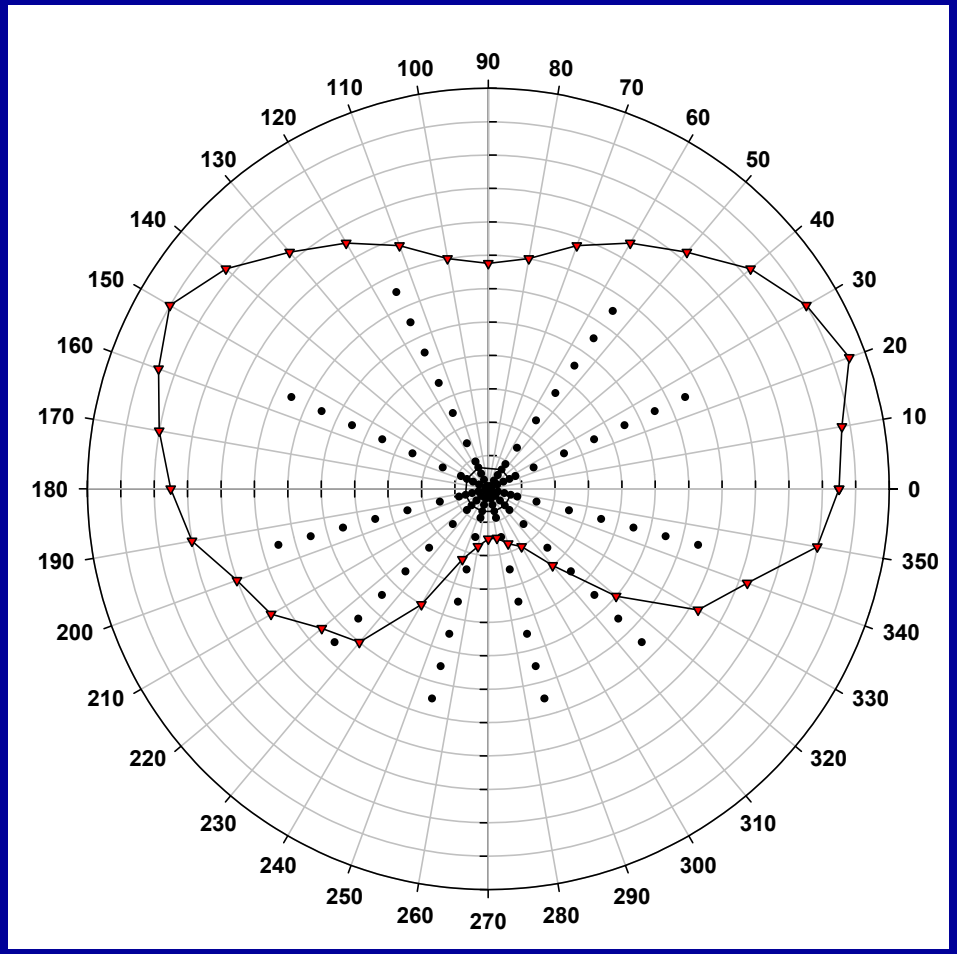
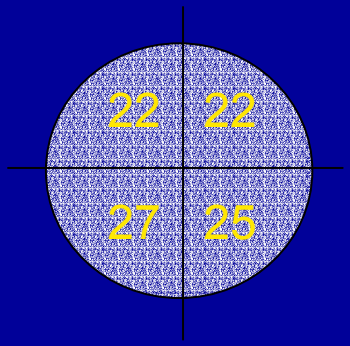
Example: Escape Hood Respirator 1: Fit 1.





VFS = 96

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Field of View Test Results

Escape Respirator	VFS FIT 1	VFS FIT 2	VFS FIT 3	VFS Avg.
Concept 1	96	96	92	94.7
Concept 2	103	104	102	103
Concept 3	93	94	93.3	93
Concept 4	97	98	99	98

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Fogging Test Conditions and Equipment

- 2 Environmental Test Conditions:
  - Low Temp Chamber -10.5 ^{0}C (13^{0}F)
  - Hot Humid Chamber 32.2 ^{0}C (90 ^{0}F); RH @ 60%
- 3 Visual Acuity Scores will be Taken
  - 1. Respirator Donned in ambient condition 22.2 ^{0}C (72 ^{0}F)
  - 2. Immediately Upon enter into Environmental Chamber
  - 3. During 2 min Rest Period after 5 min of Exercise
- Test Equipment
  - Environmental Chamber
  - Treadmill
  - Snellen Logarithmic Low Acuity Chart 2000 @ 40cm

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Fogging Resistance Requirement

- Number of Tests: 2 Tests per Environmental Condition
- 2 Different Human Subjects per Environmental Condition (Same Human Subject Allowed for Cold and Hot/Humid)
- Avg. $VAS_{Chamber} = VAS_{Chamber\ (1)} + VAS_{Chamber(2)} / 2$
- $PR(\%) = (\text{Avg. } VAS_{Chamber} / VAS_{Ambient}) \times 100$
- All 4 Performance Ratings (%) $\geq$ 70 %

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Sample Fogging Test Results

Cold Chamber Condition = -11.6 ^{0}C (11 ^{0}F) Avg. Ambient = 24.3 ^{0}C (75.8 ^{0}F); RH = 46.1%				
Model	VAS Ambient	1st VAS In Chamber	2nd VAS In Chamber	PR (%)
Model A	95	90	85	92
Model B	95	95	60	82
Model C	105	100	100	95
Model D	90	75	60	75

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Sample Fogging Test

Hot/Hum Chamber Condition 30.7 ^{0}C (87.4 ^{0}F)/ RH = 68.2% Avg. Ambient = 27.2 ^{0}C (81.9 ^{0}F)				
Model	VAS Ambient	1st VAS In Chamber	2nd VAS In Chamber	PR (%)
Model A	100	85	85	85
Model B	105	90	40	62
Model C	105	95	95	90
Model D	100	100	90	95

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Communication Requirement

- The Communication (Speech Intelligibility) capability is an Optional Feature
- If Communication Feature NIOSH Qualified:
  - Requirement: ≥ 70%

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Communication Methodology

- Modified Rhyme Test (MRT)
- Background Noise = 60 dBA ± 2 dBA consisting of a broadband “pink” noise
- Distance = 10 FT (3.1m)
- 10 MRT Trials, Yielding:
  - 15 MRT Scores per listener with Respirator and 15 w/o respirator ; (3 Listeners, 5 Speakers)

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Communication MRT Data

Escape Respirator	Concept X	Concept Y	Concept Z
Background Noise	63	63	64
Avg PR(%)	36	45	36
Std. Dev.	18	11	16
Min PR (%)	24	32	11
Max PR (%)	51	66	78

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Summary / Conclusion

- Field of View (FOV)
  - Requirement: VFS ≥ **70 Points**
  - Same FOV STP as NIOSH CBRN Full Facepiece Gas Mask
- Fogging
  - Requirement: PR(%) ≥ **70 %**
  - Conditions: Don at 22.2 ^{0}C (72 ^{0}F) and enter Low Temp -10.5 ^{0}C (13 ^{0}F) and Hot Humid 32.2 ^{0}C (90 ^{0}F); RH @ 60%
- Communications
  - Requirement: Optional
  - For Communication Qualifier, Requirement ≥ **70%**
  - Same Communication STP as NIOSH CBRN Full Facepiece Gas Mask

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